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Joshua Lederberg
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Founder's Hall
1230 York Avenue
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Dear Josh:

It was good to sit next to you at the NAS meeting. You asked me some questions about the use of fission products or spent reactor fuel as radiological weapons. I am quoting you figures as the activity of spent fuel per gigawatt year of burn-up in a reactor.

After one year that figure is 7×10^7 curies per gigawatt year. After ten years the number is 1.4×10^7. After one month it is about 3×10^8. Initially, after immediate withdrawal from the reactor, it is two orders of magnitude or so higher but this is not relevant in terms of the integrated radiological effect. The total weight of a light water reactor fuel bundle is about 400 kilograms. A spent fuel bundle withdrawn from a reactor gives an exposure of the general order of several hundred Rem per hour at a distance of 1 meter from the fuel bundle.

I have always been dubious about the military utility of radiological weapons. It used to be advocated in the early days by Ernest O. Lawrence as a "humane" weapon because of the alleged sharp boundary between the radius of lethality and the distance of essentially no effect. This is of course illusory considering the variability of terrain and absorbing materials.

If the DSB is studying this method* seriously it would be well for them to look at the after effect of the Chernobyl accident. Here a large fraction of the fission product inventory of the reactor core was released and dispersed. If one uses the linear hypothesis of dose response then one can theoretically calculate that somewhere between 15,000 to 30,000 of the people in the exposed population had their lives shortened, but demographically this turned out to be impossible to determine because of the fact that it was submerged in variabilities associated with the exposed population due to other causes. There were about two thousand cases of thyroid cancer. Most of them could be cured and almost all of them could have been prevented if the effected population did not drink milk for a few days or took large doses of potassium iodide. This does not minimize the severity of the disaster but it surely signals that as a weapon radiological dispersal would hardly be of significance relative to the direct use of nuclear weapons.

I suggest that the effect of radiological dispersal weapons might have enormous psychological impact but would result in relatively few demonstrable casualties.

I hope that you will find this information useful.

With best wishes,

Pief

Wolfgang K. H. Panofsky
Director Emeritus

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DSB Summer Study, October 1997; 'Response to Transnational Threats', Vol. I,
James L. Ford, 'Radiological Dispersal Devices: Assessing the Transnational Threat'; National Defense University, March 1988.